

and sometimes it becomes irregular. The following are the conclusions drawn by Dr. G from his experiments:—

1st. That the greatest difference occurs in patients labouring under fever, or in a debilitated state, in consequence of fever, or any other cause. It may amount to 50, 40, or even 50, between the horizontal and erect postures.

2d. That this difference decreases after the first quarter of an hour in most cases, but always remains considerable as long as the same position is observed.

3d. That in persons not much debilitated, the difference is much less than that stated above, and often does not amount to more than 10.

4th. That when the patient lies down, the pulse rapidly falls to its former standard.

5th. That in some the increase in frequency is greater between the horizontal and sitting posture, than between the latter and the erect; while in others the contrary takes place, so that generally the frequency in the sitting posture may be taken as a mean.

6th. In persons convalescent from fever or acute diseases, I find it is extremely useful to the physician to ascertain the comparative frequency of the pulse in the horizontal, and in the erect position. The greater the difference, the greater is the debility of the patient, and consequently the more guarded must his medical attendant be in allowing him to sit up for any length of time, particularly if the pulse, on his lying down, does not resume its usual degree of frequency.

Authors who have written concerning the effects of digitalis on the organs of circulation, speak of the difference between the pulse, as observed in different positions, as an inexplicable anomaly, and seem quite ignorant that a similar phenomenon occurs in a less degree in health, and in an equal degree in many diseases. The fact appears to be, that *digitalis*, besides a great and debilitating influence on the whole constitution, and particularly the nervous system, possesses a peculiar power of diminishing the frequency of the pulse; but it is no anomaly that, in persons under its influence, debilitated, and nervous as they always are, when it is exhibited in doses sufficient to retard the pulse, there should be a great difference between the frequency of the pulse as examined in the horizontal, the sitting, and the erect postures.

PATHOLOGY.

8. *Union of Fractures*.—Much diversity of opinion still exists respecting the precise process by which the union of fractured bones is effected. The most elaborate and circumstantial memoir we possess on this subject is Breschet's.* This distinguished anatomist made a number of experiments on dogs and pigeons, and was led to conclude from his observations that the process of reünion consisted in the following steps. 1st. In effusion into the surrounding soft parts, and gradual ossification of a layer of these parts exterior to the bones; 2d. In effusion into the medullary canal and its subsequent ossification; 3d. The formation of an intermediate substance between the fractured surfaces, which, in course of time, became converted into perfect bone.

In our sixth volume, p. 216, will be found an account of some experiments by M. Flourens, connected with this subject, and in the *Edinburgh Medical and Surgical Journal* for April last, are some very interesting observations by Mr. Sæm, tending to throw some light on the process under consideration.

"That the bones are not united," says Mr. S. "merely by the ossification of their periosteum, may be proved at once by cutting them through longitudinally, when the ends are found firmly united together, and even the medullary canal filled with osseous matter. If the section, indeed, is made at so early

* *Sur la Formation du Cal.* Paris, 1819.

period after the injury has been sustained, the fractured surfaces remain united; and hence Duhâmel, who, from analogy, had taken up the idea that ossification of the periosteum effected the reparation just as the deposition of wood from the bark unites the graft of a tree, was confirmed in his error, because he did not extend his observations beyond the fifteenth day.

"It is confidently maintained by some, and I myself used to subscribe to the same opinion, that the new bone or callus results entirely from the old one, and is gradually completed through successive stages, in which a gelatinous matter effused from the osseous surfaces becomes more and more firm, then cartilaginous, and at last identical with the tissue from whence it proceeded. Analogy, no doubt, is in favour of this explanation; and the appearances observed in bones at a considerable distance of time after they have been fractured also tend to support it; but there are some facts which may be alleged in objection, and, as I think, afford unquestionable evidence against its truth.

"It is daily observed, in treating fractures of long bones, such as the tibia and femur, that, notwithstanding the most careful and effectual means are employed to retain the corresponding surfaces *in situ*, they remain moveable for many days, and, indeed, generally for the best part of three weeks, during the whole of which period the crepitation heard or felt by moving the limb is as distinct as immediately after the injury has occurred. The mobility usually ceases very suddenly, and the limb all at once regains such a degree of firmness as to sustain its own weight, or resist any other equivalent force tending to bend it; but if subjected to more considerable violence at this time, it gives way again at the part originally fractured. When such fractures are dissected within the first two or three weeks of their existence, the ends of the bones are found quite separate and unconnected by any intermediate substance. These facts are quite opposed to the idea, that the uniting process consists entirely in the effusion and ossification of a substance proceeding from the surfaces of the bones, in which case the mobility should diminish gradually, and flexibility continue long after perfect mobility had ceased, before the establishment of perfect rigidity.

"Case 1.—Catharine Adams, æt. 52, was admitted on the 12th of January, soon after sustaining a fracture of the right thigh-bone in its lower third by falling on her side. Pasteboard splints were applied to keep the limb steady, and then by means of the long splint of Desault, extension was effected, so as to prevent retraction of the broken surfaces, which were very oblique. Every thing appeared to be doing well until the 23d of January, when she had a long and severe rigor, and afterwards complained of general uneasiness, with the other usual symptoms of fever. On the following day, her tongue was brown and hard; her pulse frequent, but weak; and her appearance upon the whole extremely unpromising. Thinking that she would not bear bleeding, I desired that she should have her bowels freely opened by injections, and afterwards take small doses of an antimonial solution. On the 25th, she complained of her throat being very sore, and her respiration was performed with the peculiar sound which indicates œdema of the glottis. Though this symptom was very distinctly marked, it did not seem to warrant tracheotomy, as there was no indication of any severe degree of obstruction in the breathing, and the patient appeared to be sinking independently of this local disease. I therefore directed blisters to be applied to the throat, and stimulants to be given frequently. She died next day.

"On dissection, the fracture was found to extend obliquely from near the middle of the bone down to the external condyle. The muscular fibres and cellular substance in the neighbourhood of the injury were altered in colour as well as consistence, by the effusion of gelatinous matter into their texture. A kind of bag or capsule was thus formed, embracing the whole extent of broken surfaces, and containing two or three ounces of fluid blood. The parietes composing it were in some parts connected to the very edge of the bone, but in others they became adherent to it at a distance of an inch or more from the ex-

tremity, leaving a space to this extent uncovered, and apparently denuded of periosteum. When carefully examined, this exposed portion was ascertained to be covered by a thin layer of gelatinous substance, which did not possess the toughness or other characters of a membrane; and the respective surfaces of the bone had a covering of the same kind. The medullary membrane was very vascular, and more distended than usual.

"In examining the structure of this bag, I endeavoured to ascertain which of the natural tissues entered into its formation, and in what parts of it, if any, ossification had commenced. On tracing the periosteum from the sound bone, I found that where the bag adhered, that membrane became thick, and evidently continuous with its walls. It seemed probable that where the membrane had been stripped off the bone, as already mentioned, it might assist to form, in some small part, the sac in question; the great extent of which, however, was evidently constituted by the neighbouring tissues, whatever they happened to be, muscle, tendon, fat, or cellular substance, all being reduced to the same appearance internally, by vascularity of the surface, and the same consistence, by the interstitial effusion of organizable matter.

"On introducing my finger into the bag, so as to feel if there were any indications of ossification, I perceived some small grains or specks of bone, which, when minutely examined, presented a stellated appearance, and were ascertained to lie in the substance of the capsular membrane. When examined in the same way near its connection with the bone, it was found to contain much larger masses possessing osseous firmness; in order to ascertain the precise seat and origin of which, I carefully dissected the membrane where they existed, and then found that they lay completely imbedded within it, having a covering from it on both sides; also that they did not adhere to the bone, being separated from it by a thin layer of the membrane, so as to admit of a slight degree of motion; but at these parts, the shaft itself had begun to shoot out a growth of new bone.

"Case 2.—Mary Donaldson, a poor emaciated old woman, seventy years of age, was admitted on the 27th of September, on account of a compound fracture of the left leg close to the ankle. Both the tibia and fibula were shattered into many fragments, and there was a wound over the latter bone extending down to it. Pasteboard splints were applied, the limb being laid on its outer side with the knee bent; but the patient proved so unmanageable and undocile in favouring the maintenance of steadiness in this position, that I was obliged to have recourse to Macintyre's inclined plane, which answered the purpose perfectly. She made no complaint afterwards, and all her functions were performed in a natural manner. For nearly three weeks crepitus could be distinctly felt when the limb was moved, but then the bones united, the wound healed, and on the 25th of October the cure seemed to be complete. The splints were then removed, and a simple roller applied. On the 5th of November, she was dismissed with the limb perfectly straight.

"About ten days afterwards, I was much surprised to learn that she had died in consequence of some internal disease, and having procured permission to dissect the limb that had been fractured, obtained possession of the bones for their more careful examination. When divested of their muscular coverings, they presented an appearance hardly differing from that naturally belonging to them. All the pieces into which they had been broken were firmly united to each other and to their shafts, and were covered with a periosteum of usual consistence. On closer examination, the interstices between these portions were found to be occupied by a soft bloody gelatinous substance, to ascertain the precise extent of which the preparation was macerated. When all the interstitial matter had been thus separated, it was seen that the united fragments of the tibia, which were thirteen in number, constituted merely a skeleton, so to speak of the cylinder, and that the central cavity remained entirely vacant. On examining the internal surface of this imperfect shell, it was evident that an ossific process had been going on over the whole of it, and I have no doubt,

that, if the patient had lived some months longer, the bones would have become completely solid. The fibula presented similar appearances, though on a smaller scale, and the process of reünion was more nearly perfected. There is in my possession the preparation of a thigh-bone which was fractured through the neck and trochanters, and was treated by my friend Mr. George White. The patient died two months after the accident from some other cause. It now appears, the bone having been macerated, that all the broken portions are firmly united together at the edges, but that all their internal surfaces remain perfectly distinct and separate. The appearance, in short, is very nearly the same, and, I believe, would also have terminated in compact ossification, if the necessary time had been afforded."

9. *Ischuria Renalis*.—J. Binn, Esq. relates in the fourth volume of the *Transactions of the Medical and Physical Society of Calcutta*, the following interesting case of this disease. A man, aged fifty, came into the hospital, October 18th, 1818, complaining that he made urine in very small quantity; not more than a tea-cupful being passed in twenty-four hours. Had some nausea, but no fixed pain in any part. When first attacked, which was several hours previous to the time of his admission, he felt some uneasiness in the lumbar region, and was seized at the same time with vertigo; but having taken a draught of Tinct. Opii, with Spirit. Ether. Nitrus, he felt easier. I ordered him a dose of castor oil; after the operation of which, the draught before given was to be repeated.

Second day.—The oil had operated freely, but there was no alteration in the state of the symptoms. The draught was repeated several times in the course of the day.

Third day.—The sensorium appeared much affected; as marked by a great inclination to sleep, an uncollected state of mind, and loss of memory. His eyes were of a suffused yellow colour, and were slightly injected with blood. The pulse was full and slow, and there was a convulsive motion in the arm. The catheter was introduced into the bladder, which contained no urine. He was bled to the extent of xx. ounces, and after taking four grains of calomel with an equal quantity of antimonial powder, had a blister applied in the lumbar region. The blood drawn was cupped, and threw up a little buff.

Fourth day.—There was less affection of the sensorium; but the urine did not increase in quantity. A brisk purgative of calomel and compound powder of jalap being given, its effect could not be accurately ascertained. A blister was also applied to the nape of the neck.

Fifth day.—The affection of the sensorium increased; there was great inclination to sleep; and his tongue, which was brown, was covered by a horny crust. When told to show it, he did not withdraw it again until ordered to do so. Several strong purgative medicines were given without any effect.

Sixth day.—The symptoms of coma continuing to increase, and his bowels remaining obstinately immoveable, purgative glysters were given very frequently, without any advantage.

Seventh day.—The symptoms continued to gain ground, and death followed towards the afternoon.

DISSECTION.—*Abdomen*.—The stomach was much thickened; and its villous coat was unusually vascular. The liver, which was much enlarged, displaced the intestines, and had elongated the mesentery. The gall-bladder contained a dark ropy bile, of the appearance of tar. The spleen, which was enlarged to more than five times its natural size, was firm and fleshy. The duodenum contained much brown mucus. The culon was contracted throughout its whole extent. The kidneys were enlarged to double their usual size, and were much altered in structure, having the pelves unnaturally small, and the mamillary processes so changed, as to be with difficulty distinguished from the generally diseased mass. In short, the impression left on the mind was, that urinary se-